Energy Conservation Through Official Plans

A Guideline

Ontario

Ministry of
Municipal Affairs
and Housing

August 1982

Honourable Claude F. Bennett, Minister
Ward Cornell, Deputy Minister

Available from:

Ontario Government Bookstore
880 Bay Street
Toronto, Ontario M7A 1N8

TABLE OF CONTENTS

1. Introduction 1

2. The Energy Issues 3

3. The Scope of the Official Plan

3.1 Provincial Concerns 6

3.2 Changing Form and Structure 6

3.3 Trade Offs among Competing Goals 8

3.4 Creating Options for the Future 8

3.5 Jurisdiction and Implementation 9

4. Official Plan Guidelines

4.1 General Context 11

4.2 Community Form and Structure 11

(a) Compact Developed Areas 11
(b) Optimum Land Use Mix and Spatial Relationships 12

4.3 Residential Land Use Designations 14

4.4 Neighbourhood Planning and Design 15

4.5 Official Plan Policy Statements 16

(a) Development Applications 17
(b) Reuse of Existing Buildings 18
(c) Retrofit, Renovation 19
(d) Transportation 20
(e) Energy Distribution Systems 20

5. Conclusions 22

Bibliography

1. INTRODUCTION

The need to ensure the efficient use and conservation of energy has become a high priority for government action as energy prices rise and supplies remain uncertain. The Ontario Government has responded by forming the Ministry of Energy and initiating a variety of programs and research projects. Municipal governments are also becoming more actively involved in the effort to promote energy efficiency in their jurisdictions and are pursuing a wide variety of local initiatives.

Land use planning and development is one area of municipal responsibility in which energy efficiency is an issue. In order to promote energy conservation at the local level, energy considerations must be given a greater emphasis in the formulation of policies and in the evaluation of development proposals. A first step in this reordering of priorities may be the establishment of a policy context in the local official plan. Such a policy context would provide the basis for future council decisions and for land use mechanisms or tools such as zoning, subdivision approvals and site plan control.

This guideline has been prepared to provide assistance in the preparation of official plan policies promoting energy efficiency. Because of the new priority to be given to energy considerations, the energy-related land use issues are outlined briefly in chapter 2 to provide background on the subject in general. The scope of the official plan for achieving increased energy efficiency is discussed in chapter 3. As part of this discussion, provincial concerns are explained. Finally, in chapter 4, a set of specific guidelines is presented on the matters to be taken into consideration in the formulation of official plan policies. A bibliography of relevant material is also provided.

It should be noted that official plans, and land use planning in general, represent only one area of opportunity available to municipalities for the promotion of energy conservation. There are

many options for action in the energy field not requiring initiatives in the official plan. These options include reducing energy consumption in municipal operations, small scale local energy production, participation in district heating and cogeneration projects, traffic controls and planning for hard services, data collection and research on local issues and educational and promotional programs. Municipalities are encouraged to pursue a full range of energy-related actions.

2. THE ENERGY ISSUES

The relationship between land use planning and energy conservation is complex. It is possible, however, to identify the more important land use characteristics which have energy efficiency implications.

The greatest potential for conserving energy through land use policies is reducing transportation requirements which accounted for 27% of all energy used in Ontario in 1980. While the long distances in Ontario and the reliance on the private automobile explain a large part of the high demand for energy for transporation on a province wide basis, decisions about where people live compared to where they work, shop and play also have important impacts. The spatial relationships of all land uses, then, affects the length of trips, the number of trips and the mode of travel which are directly related to energy consumption. Municipalities can attempt to modify these factors by adopting official plan policies which would guide development and redevelopment in such a way that the need to travel would be minimized.

There are also some opportunities for improving energy efficiency in residential land use by means of land use policies. Since this sector consumed 21% of all energy used in Ontario in 1980, these improvements can be of significant size. It has been found that house form has a significant impact on the energy efficiency of residential space heating. This use of energy accounts for 75% of the energy consumed in dwellings in the Ontario climate. Studies show that, comparing their residential space heating requirements, semi-detached houses are 20 to 30% and townhouses 40 to 50% more energy efficient than single family detached houses.

Policies in official plans about housing mix in the community, therefore, may have considerable impact on the energy efficiency of the residential sector. In addition, there may be some opportunities for influencing type of fuel used. For example, the availability of

alternatives to heating oil such as natural gas can provide a basis for locational policies. Similarly, protecting solar access to buildings may be important.

From an official plan point of view, land use planning will not have a significant impact on energy efficiency within the other major land use categories. For example, within the industrial sector, which as the largest sectoral consumer of energy accounted for 40% of the energy used in Ontario in 1980, energy conservation and efficiency will be achieved primarily through improved industrial processes. There are, however, possibilities of cogeneration or the use of waste heat from some industrial processes to power other activities. This may require consideration of land use policies which ensure the appropriate development of adjacent lands. In addition, although not affecting energy consumption within the sector, the location of industrial activities as places of employment and as centres of product distribution has direct implications for energy consumption in the transportation sector.

The commercial and institutional sector consumed 12% of the energy used in Ontario in 1980. In this sector, building technology will be of considerable importance for improvements to energy efficiency. As with the industrial sector, however, the location of commercial and institutional buildings as places of employment and as service centres will have implications for the relative energy efficiency of the transportation sector.

In conclusion, energy consumption in the transportation and residential sectors is most readily influenced by land use planning decisions and, consequently, by official plan policies. In the transportation sector need to travel including the length, number and type of trips can be influenced by the arrangement and separation of land uses. In the residential sector, space heating requirements can be affected by the mix of housing types.

Official plan policies which promote energy efficiency therefore, would be based on the primary objectives of:

- minimizing travel demand; and
- minimizing space heating needs in the residential sector.

3. THE SCOPE OF THE OFFICIAL PLAN

3.1 Provincial Concerns

It is appropriate that energy matters be taken into consideration in formulating official plan policies and that the efficient use and conservation of energy be a specific goal of municipalities in establishing land use controls.

It is a goal of the province to reduce the per capita growth rate of the demand for all forms of energy with particular emphasis on reducing the demand for oil. This general goal has been reflected in the White Paper on The Planning Act and in the proposed new Planning Act where the efficient supply and use of energy is identified as an area of provincial interest which has implications for land use planning.* Official plan policies, then should contribute to the achievement of the provincial goals.

In developing these policies, municipalities should take into consideration the following matters relating to the role and scope of the official plan in general.

3.2 Changing Form and Structure

The official plan provides certain opportunities for pursuing the objectives of reducing transportation demands and space heating requirements. One of the prime functions of an official plan is to

---

* Note that the wording proposed in Section 2(c) of the new act is

> "2. The Minister, in carrying out his responsibilities under this Act, will have regard to, among other matters, matters of provincial interest such as
>
> 'c) the supply, efficient use and conservation of energy".

prescribe the desired long term development pattern in a municipality through the allocation or distribution of specified land uses and densities. The resulting spatial configuration is usually displayed in map form.

Total transportation needs in a community are determined to a large extent by the degree of compactness and self-sufficiency and the proximity of interrelated uses. Similarly, residential space heating needs per unit decrease as the amount of multiple-unit housing increases.

The spatial distribution of land uses and densities is often referred to as the form and structure of the community. A municipality can attempt to alter the community form and structure through the adoption of official plan policies which direct future growth and redevelopment into appropriate locations and at appropriate densities to improve energy efficiency.

While adopting official plan policies to improve the efficiency of the form and structure of the local community may seem to be clearly desirable, it must be recognized that settlement patterns and urban form are well established in the province and much of this development was based on the assumption of abundant cheap energy. In many municipalities and especially those with slow rates of growth, it will simply not be possible to achieve substantial changes either in the degree of compactness or in the interrelationship of land uses. Similarly, it has been estimated that 2/3 of the housing stock needed by the end of the century is already in place. Given these constraints but recognizing the importance of incremental changes in a community, official plan policies should provide for new development and for modifications to the use of existing development which are consistent with energy conservation principles.

3.3 Trade Offs among Competing Goals

It must be understood, further, that the goal of promoting the efficient use and conservation of energy is only one consideration in formulating official plan policies. A municipality must also take into consideration a number of other goals relating to social, economic and environmental matters which are within local jurisdiction. In many cases, the policies promoting energy efficiency will be consistent and perhaps even complementary to the policies designed to achieve other goals. For example, the preservation of agricultural land and provision for compact communities require complementary policies.

However, there may also be conflicts. For example, the provision of a full range of housing types and locations to ensure maximum choice may not be consistent with the requirement for energy efficient multiple unit housing at the expense of detached housing and estate residential development. Similarly, the reduction of through traffic in neighbourhoods may conflict with the energy conservation objectives of reducing the length of trips and traffic congestion.

In situations of conflict, trade offs must be made. The priorities among competing land use goals will vary depending on local conditions and aspirations. Under current circumstances, energy conservation will sometimes be secondary to other concerns such as improving the level of residential amenities or reducing conflicts between land uses. When such trade offs are made, they should be made consciously and only when the community benefits to be gained outweigh the costs of forfeiting energy efficiency.

3.4 Creating Options for the Future

Even if settlement patterns could be substantially altered, the ability of the public to make fundamental individual choices about type of housing and location is a basic component of our planning system. Currently, certain premiums are placed on the extra space

available in suburban locations, the higher degree of privacy in detached houses, and the greater convenience and flexibility of the private automobile. Such values and expectations cannot be ignored or quickly changed. In fact, there is a good possibility that some people will continue to pay increasingly higher prices for these amenities. Alternatively, those currently interested in energy efficiency may be faced with restricted choices in the housing market.

Given the need to maintain the freedom of individual choice, then, a municipality should adopt official plan policies which create and maintain options for future energy efficient development at strategic locations. As energy prices rise, the public would be able to make decisions to reduce commuting distances, to use more efficient modes of travel or to consolidate shopping or business trips, for example, in order to reduce energy expenditures over the long term.

3.5 Jurisdiction and Implementation

In the interest of maintaining the usefulness and effectiveness of the official plan document, it is important that energy-related policies be capable of being implemented by the municipality. The official plan is a local document which applies to local decision-making. It cannot be used to commit other governments or autonomous agencies to any course of action. Policies, therefore, should deal with matters which are within the jurisdiction of the municipality as defined by legislation.

Further, it is important that there be means available to achieve official plan policies. The measures and procedures to be adopted to implement policies should be thought out so that the local council can be certain that the policies are feasible. It is inappropriate to include policies in official plans if there are no means available for implementation. General motherhood-type statements are of little value unless they are tied to specific objectives and strategies or measures for achievement. In addition, official plan policies should

relate to matters of land use and not to all corporate activities of the municipality.

The primary measures available for implementing official plan policies are the land use controls provided for in the Planning Act. These consist of zoning by-laws including amendments and minor variances, site plan control, the subdivision review and approval process, consents and property standards by-laws. The relationship between these controls and specific official plan policies should be clearly understood. Municipal capital works can also be effective in implementing official plan policies. The official plan, then, should set the policy context for these implementing mechanisms.

4. OFFICIAL PLAN GUIDELINES

4.1 General Context

Including energy efficiency as a consideration in the formulation of official plan policies means certain principles must be considered. While it is not possible to develop a detailed list of principles to be taken into consideration in every municipality, it is possible to identify the more important general aspects of a land use plan which have energy efficiency implications. It should be noted that the approach taken and the appropriateness of policies will depend on municipal size, geographic context, existing form and structure and growth rate. For example, a deconcentrated urban form may be the most energy efficient for a large metropolitan area but not for a medium-sized city where many small subcentres might result in unnecessary duplication and increased need to travel for a full range of services.

In this section, the general principles to be taken into consideration in formulating energy efficient official plan policies are outlined. Any trade offs that might be involved are not discussed. These trade offs would vary by municipality and over time. The emphasis, therefore, is placed on optimum energy decisions.

4.2 Community Form and Structure

(a) Compact Developed Areas

As a general principle, the land area designated in an official plan for urban-type development should be minimized and should be compact and contiguous. In such a compact urban form, the distances between places would be reduced. In addition, the higher densities would provide better support for public transit. Such form can be achieved by clearly defining settlement areas and by providing for development at medium and high densities. Conversely, development would be

limited outside defined settlement areas. The specific principles to be considered include:

(i) appropriate density and location of new development.

- provide for higher densities for all land use categories.
- locate higher densities along transportation corridors and in nodes to support public transit.
- ensure that areas designated for future development are adjacent to existing developed areas and that development takes place in a logical manner (i.e. do not allow "leapfrogging").

(ii) intensification of existing built-up areas.

- allow redevelopment of underutilized areas and buildings at greater densities.
- provide for the infilling of vacant lots and the unused portions of large lots in central locations.
- permit the conversion of existing buildings to more intensive uses (e.g. conversion of large single family homes into multi-family, conversion from warehousing to office uses in strategic locations, conversion from single to multiple uses).

(b) Optimum Land Use Mix and Spatial Relationships

Within the overall urban form, the specific mix of uses and the location of different uses in relation to each other affects the need to travel. Even in a highly compact area where distances are limited, if uses were arranged so that many trips from one side of the community to the other were required, the total amount of travelling done within the community could still be high. Similarly, if there were not a balance between jobs and residences, commuting outside the community would be required.

The ideal situation, then, would be one in which a balance of uses were arranged in proper relation to each other to minimize the need to travel long distances and to make a number of separate trips on a regular basis. The arrangement of uses can also affect the preferred mode of travel by making public transit systems convenient and by making walking between uses feasible. Obviously, the public would finally decide whether to take advantage of such opportunities. The basic principles to be considered in establishing and allocating land use designations however, would include the following:

(i) integration of different land uses.

- provide for mixed use buildings and areas to bring complementary uses close together.
- allow complementary or service type uses within basic land use designations (e.g. convenience shopping in residential and industrial areas).
- desegregate residential areas to allow more home occupations (including the possible extensive use of telecommunications, which could allow people to work at a variety of jobs from their homes in the future).

(ii) interrelated uses located in close proximity.

- allow residential uses close to places of work (office, industry).
- designate sufficient area for employment activities (e.g. office and industry) within the developed area.
- conversely, do not allow major concentrations of employment to locate at a distance from residential areas (e.g. industrial parks distant from housing).
- ensure that a wide range of recreational opportunities are available in close proximity to other uses, plan for major recreational opportunities within easy access of the built-up area.

(iii) concentration of service and commercial activities.

- provide for "service nodes" of commercial, institutional and government activities to allow for convenient non-vehicular movement between buildings.
- restrict car-oriented strip development.

4.3 Residential Land Use Designations

Another element of official plan land use policies which relates directly to energy conservation is the residential land use designation. There are wide variations in the way municipalities deal with residential land uses in their official plans. There may or may not be references to dwelling type. Often, the designations are based on density categories to provide greater flexibility but maintain control over the intensity of development.

However, the allocation of residential densities and perhaps house type will affect both the space heating energy requirements and the transportation energy needs in the community. The principles to be taken into consideration include:

(i) medium and high density housing.

- provide for higher densities to reduce the amount of land used.
- provide for multiple-unit housing types, attached dwellings.
- establish minimum densities (i.e. preserve certain locations for higher densities and do not allow densities below the prescribed level).

(ii) appropriate location of higher density housing.

- locate higher densities along transportation corridors and in nodes to support public transit.
- locate higher densities close to employment concentrations (centres and subcentres).
- establish minimum densities in strategic locations to maintain option over the long term for providing maximum housing in energy-convenient locations.

4.4 Neighbourhood Planning and Design

While the official plan deals with broad land use designations and general locations, a municipality may also undertake a more detailed planning exercise at the neighbourhood level or for any subarea of a municipality. Such an exercise may or may not lead to formal official plan policies. If it does, the principles discussed earlier would still apply at the smaller scale:

(i) density.

- include as much multiple-unit or attached housing as is reasonable.
- locate higher densities near major transit arteries, and so as not to overshadow lower density areas.

(ii) mixture of uses.

- allow home occupations.
- provide for neighbourhood level services and facilities in convenient locations.

(iii) neighbourhood street system.

- minimize street length to provide energy savings in construction, maintenance and services that follow roads as well through reduced trip lengths in the community.
- double load streets and service ways to optimize use (i.e. lots on both sides).
- minimize requirements for stops.
- provide for road alignments that create lot orientations which maximize solar access.
- provide for transit accessibility, facilitate movement of transit vehicles through community, provide convenient access to transit stops.
- provide for convenient pedestrian and bicycle routes through community, with access to local facilities.

(iv) lot and building orientation.

- arrange lots and site buildings so that all buildings have major southern exposure.
- encourage the design of buildings to take advantage of solar access.
- encourage landscaping which complements solar access (e.g. deciduous trees to the south to provide summer shade, coniferous trees to north-west to cut down winter winds).

4.5 Official Plan Policy Statements

A municipality can also include goals and policies for energy-related land use issues affecting the entire municipality. Such statements can be important in clarifying the position of the municipality and establishing a council commitment to deal with land use issues in a way sensitive to energy conservation. These commitments provide a context for future decision making and give the public both certainty

in understanding the intent of the municipality and encouragement in private energy conservation measures.

The precise form and content of energy policy statements will depend on the organization of the plan, local attitudes and circumstances. As examples, policies could be established on the following issues.

(a) Development Applications

The importance of the location, mix and density of new development has been discussed. In addition to these basic but general characteristics of new development, the more detailed aspects of a proposal have significant implications for the ultimate energy efficiency of development projects. Subdivision design and siting of buildings, for example, are important considerations.

If a municipality wanted to encourage prospective developers to incorporate energy efficient design aspects into their development proposals, it would be appropriate to include policy statements indicating that, when approvals were required, some weight would be given to the relative efficiency of the proposal and that innovative designs would be supported. Prospective developers would thereby be given some certainty that their efforts and investments would receive some positive response from the municipality.

Energy efficiency could also be identified as a criterion in considering applications for official plan amendments required to allow developments such as rural residential subdivisions or infill projects. As a caution, care must be taken to ensure that proposals, which are promoted by their proponents as being energy efficient, do actually achieve the goals of the municipality. A "solar" subdivision located at some distance from employment and services could not be supported purely on energy grounds. Policy statements, therefore, may be included in the official plan to:

- indicate council encouragement and support for energy efficient development.
- specify development concepts to be supported (e.g. innovative design, passive solar considerations such as siting and road layout, active solar systems, features supportive of transit and pedestrian movement and infill projects).
- identify the factors to be considered in the evaluation of applications for official plan amendments to allow new developments (e.g. density, location and use criteria for evaluating such proposals as infill developments or fringe developments such as rural residential).

(b) Reuse of Existing Buildings

In order to improve the energy efficiency of the existing built form, a municipality may want to encourage more intensive new use of existing buildings in certain locations in the municipality. Such changes may very well require amendments to zoning regulations or minor variances. In the first place, basic use and density provisions may have to be amended. In addition, older buildings may not meet contemporary zoning standards or the standards applicable to the proposed new use may be more restrictive than those standards for the original use. If necessary amendments were not allowed, the building owners would be encouraged to demolish the existing structure and to rebuild. Therefore, in order to encourage the retention of existing buildings, it would be useful for the municipal council either to make necessary general by-law changes or to indicate its willingness to support the necessary by-law changes. Such a commitment could be made in an official plan policy statement. Policy statements, therefore, may be included to:

- indicate the commitment of Council to the reuse of buildings and the support for amendments to the zoning by-law or minor variances required to allow the changes.

- identify criteria for changes in use such as types of changes encouraged (e.g. single to multiple family, single to mixed use) and locations (e.g. close to transit, on periphery of stable residential areas).
- provide guidance on the type or extent of amendments to be considered (e.g. substantial reductions in setbacks, parking, landscaping or increase in coverage) and the basis for consideration (e.g. transit accessibility, availability of parks, historic buildings).

(c) Retrofit, Renovation

Retrofit or energy-inspired renovation means the modification of existing buildings to improve energy efficiency. This may include the installation of active solar heating devices as well as alterations to improve passive solar efficiency. Such modifications may result in changes to the size and appearance of a particular building. Solar collectors on roofs and on free standing structures, greenhouses and trombe walls may result in reduced set backs and increased building bulk and height which may not conform with zoning regulations. Such alterations may also change the character of the building setting it apart from other buildings in the neighbourhood or area. If a municipality wanted to encourage private landowners to make energy improvements to their buildings, then that encouragement would require a willingness to amend zoning regulations. Policy statements, therefore, may be included to:

- indicate encouragement and support for retrofit by private landowners including support for zoning amendments or minor variances if required.
- provide guidance on the type or extent of amendments to be considered and the basis for consideration.

(d) Transportation

Transportation requirements within a municipality are, to a large extent, determined by the form and structure of the community. Many land use decisions have significant transportation implications which, in turn, have direct energy impacts. Because of the interrelationship between land use and transportation, official plans often contain separate transportation sections which establish the transportation principles on which other land use decisions are to be based. Essentially all transportation principles can be considered to be energy-related policies. At the same time, it must be recognized that the details of transportation policies will vary considerably from municipality to municipality. In general terms, however, policy statements may be included to:

- establish the support of council for such concepts as compact community form, close proximity between homes and jobs and the integration of development in order to limit transportation requirements.
- indicate the priority to be given to public transit and the land use measures and public actions to be taken to support that priority (e.g. location of major public facilities, concentration of development along transit corridors).
- establish municipal policies for public pedestrian or bicycle systems on public property.
- identify criteria for pedestrian, bicycle and public transit access within new private developments including linkages to public system.

(e) Energy Distribution Systems

Energy supply and distribution are primarily the concerns of the senior levels of government. There are, however, some aspects of energy supply and distribution which can be facilitated at a local level.

District heating refers to a system where steam or hot water is produced in a large central plant and then is distributed through an underground piping network to individual customers. The central supplier may be a large institution (e.g. hydro, hospital) or a private organization. Municipal governments may be involved through co-ordination of the production and distribution network. This involvement may be reflected through a local official plan by indicating the degree of support forthcoming or the role of district heating in particular areas of the municipality. It should be noted that in order to include any reference to district heating in an official plan, a considerable amount of investigation is required to assess the feasibility and desired municipal role.

Cogeneration refers to the use of waste heat from some industrial processes to power other activities. This concept requires a high degree of co-operation among different industrial operations. Municipalities may become involved as a co-ordinating agency. This would generally be handled through the local development office. Again, however, a municipality after having investigated the opportunities for cogeneration and for municipal involvement may include in its official plan a reference to its desired role in cogeneration schemes. Therefore, policy statements may be included to:

- indicate the level of committed municipal support (e.g. co-operation, participation) in district heating, cogeneration projects or other local energy supply and distribution schemes.

5. CONCLUSION

All levels of government should be giving increasing attention to the energy implications of their decisions. Municipalities, among their other responsibilities, should ensure that their official plans provide for energy efficient community form through the long term planning, development and redevelopment process.

The degree to which municipalities can promote energy conservation through their official plans largely depends on the amount of development and redevelopment occuring. Urban municipalities experiencing large amounts of development and redevelopment have a better opportunity to effect energy conservation through official plans than urban municipalities with slower growth or rural municipalities.

Municipalities preparing new official plans have a prime opportunity to plan for energy efficient form in deciding the distribution, mixture and density of land uses.

Municipalities with official plans not undergoing immediate, comprehensive review may find policies committing an approach to land use decisions sensitive to energy issues an effective first step. Even before adopting such policies, these municipalities may be able to apply some of the neighbourhood planning and design principles described in this guideline as lands are developed or redeveloped.

For all municipalities, considering energy efficiency in land use decisions reinforces recognized planning principles rather than introducing completely new principles. Compact communities, interrelated land uses located in close proximity, infill development, medium density housing and reuse of existing buildings are examples of planning principles supporting energy conservation objectives.

This guideline provides a framework for the preparation of official plan policies to promote local energy efficiency under the current Planning Act. The planning principles should be followed wherever possible given local conditions and particular circumstances. In addition, it is important that official plan energy policies deal with land use matters which are within the jurisdiction of the municipality and are capable of being implemented.

BIBLIOGRAPHY

General

Blumenfeld, H., "Some Simple Thoughts on the Energy Crisis", Plan Canada, Vol. 20, nos. 3 and 4, September-December 1980.

Bureau of Municipal Research, What Can Municipalities Do About Energy (Toronto: BMR, Topic No. 5, March 1978).

City of Toronto Planning Board, Energy Policy for the City: Better Services for Less Energy (Toronto: April 1979).

Gibson, J., Local Energy Initiatives in Canadian Urban Settlements (Ottawa: Central Mortgage and Housing Corporation, March 1979).

Jochymenko, A. (Ed.),The Economics of Industrial Cogeneration of Electricity (Toronto: Ontario Hydro, 1979).

Lang, R. and A. Armour, New Directions in Municipal Energy Conservation: The California Experience (Toronto: Ontario Ministry of Energy, January 1980).

Lang, R. and A. Armour, Energy Conservation and the Municipal Planner (Ottawa: Energy, Mines and Resources Canada, February 1980).

Lang, R. and A. Armour, Sourcebook: Energy Conservation in Twenty Canadian Cities (Toronto: City of Toronto, 1980).

Lang, R. and J. Lounds, Information Resources for Municipal Energy Planning and Management (Downsview, Ontario: York University, June 1979).

Nitkin, D., "Municipal Land Use Planning and Opportunities for Energy Conservation", Futures Canada, Vol 3, no. 2, 1980.

Ontario Ministry of Energy, Energy Efficiency in Municipalities: The Law (Toronto: June 1980).

Ontario Ministry of Energy, Energy Security for the Eighties: A Policy for Ontario (Toronto: September 1979).

Ontario Ministry of Energy, Energy Efficient Community Planning: Proceedings of Seminars held by the Ontario Ministry of Energy in January 1980 (Toronto: October 1980).

Ontario Ministry of Energy, Energy Note (Toronto: periodic publication).

Ontario Ministry of Energy, Ontario Energy Review Second Edition (Toronto: March 1981)

Sewell, W.R.D. and H.D. Foster, Energy Conservation Through Land Use Planning: A Synthesis of Discussions at a Symposium held in Montreal 26-28 March 1980 (Ottawa: Environment Canada, August 1980).

Wilbur Smith, & Associates, Metropolitan Toronto Area Transportation Energy Study (Toronto: The Municipality of Metropolitan Toronto, Toronto Transit Commission, Ontario Ministry of Transportation and Communications, December 1980).

Buildings and Site Design

Erley, D. and M. Jaffe, Site Planning for Solar Access: A Guidebook for Residential Developers and Site Planners (Chicago: American Planning Association, 1979).

Fliess and Partners, Site Planning Guidelines for Medium Density Housing (Toronto: Ontario Ministry of Housing, January 1980).

Housing and Urban Development Association of Canada, Builders' Guide to Energy Efficiency in New Housing (Toronto: HUDAC and Ontario Ministry of Energy, 1980).

Jaffe, M. and D. Erley, Protecting Solar Access for Residential Development: A Guidebook for Planning Officials (Washington, D.C.: American Planning Association, 1979).

Klein & Sears, Opportunities and Constraints for Infill Development (Toronto: Ontario Ministry of Housing, July 1980).

Lavlin, Inc., Subdivision Design Guidelines to Facilitate Transit Services (Ottawa: Canada Mortgage and Housing Corporation, March 1979).

Okins, Leipeiger, Cuplinskas, Kaminker & Assoc. Ltd., Residential Passive Solar Heating: Review and Development of Design Aids (Toronto: Ontario Ministry of Energy, 1980).

Ontario Ministry of Energy, Perspectives on Access to Sunlight (Toronto: 1980).

Ontario Ministry of Energy, Subdivisions and Sun: 3 Design Studies (Toronto: 1979).

Ontario Ministry of Energy, Turn on the Sun (Toronto: September 1977).

Ontario Ministry of Housing, Residential Site Design and Energy Conservation Part I General Report (Toronto: April 1980).

Ontario Ministry of Housing, Saving Energy By Way of Site Design (Toronto: 1980).

District Heating

Acres Shawinigan Ltd., District Heating Study (Toronto: Ontario Ministry of Energy, February 1976).

Acres Shawinigan Ltd., District Heating for Small Communities (Ottawa: Energy, Mines and Resources Canada, January 1977).

Gahbauer, S.F., District Heating in Three Nordic Countries: What Can Ontario Learn? (Toronto: Ontario Ministry of Energy, 1978).

J.F. MacLaren Ltd., District Heating Information Study (Toronto: Ontario Ministry of Industry and Tourism, May 1978).

J.F. MacLaren Ltd., Feasibility of District Heating in Downtown Sarnia (Toronto: Ontario Ministry of Energy, March 1979).